Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

~~SECRET~~ CONFIDENTIAL

June 18, 1957

FILE COPY

ENGINEERING REPORT

GROUND SIMULATOR PROJECT

WATERTIGHT CONTAINERS

EB-176A

1210-C-7

[redacted] 25X1

[redacted] 25X1

~~SECRET~~ CONFIDENTIAL

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

ENGINEERING REPORT ON THE GROUND SIMULATOR PROJECT

WATERTIGHT CONTAINERS

The investigations conducted on this phase of the task were primarily concerned with means of transporting concealment items in watertight containers. One of the primary objectives was to develop a unit which would be capable of rapid attachment and detachment to and from metal surfaces. Further, these containers should be capable of withstanding shock and vibration encountered on such transportation as freight trains, motor vehicles or surface craft.

One of the most logical means of attaching materials to metal is by magnets. This method appeared to be the most practical and investigations were begun to adapt magnets to the various shapes and sizes of containers required.

Several stainless steel containers, (as shown open in Figure 1A and closed in Figure 1B) were fabricated and submitted for evaluation. After unfavorable reports were received relative to the performance of these containers (excessive sound transmission during vibration tests) an investigation was started to improve this deficiency by utilizing materials having good acoustical properties as well as structural strength.

In order to overcome the deficiencies of the stainless steel containers, it was decided to utilize polyester resins for the container in order to take advantage of low mold cost and relative ease of handling. This approach appeared to solve the problem of producing limpet containers of various sizes plus a noticeable reduction in sound transmission.

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

A simple method of fabrication was developed which requires the services of only slightly skilled personnel. For example, if the payload compartment is 2" x 2" x 1", all that is required to fabricate such a container is a rubber block to represent the payload compartment, a piece of cardboard, and four pieces of wood to form the sides (Figure 2). The rubber block is cemented lightly to the cardboard, approximately in the middle. The wood sides are then assembled around the rubber block allowing enough space on two sides for placing the magnets. All mold surfaces are then coated with silicone 200 fluid or Johnson paste floor wax as a release agent. The catalyzed polyester resin is then poured into the mold 1/8 inch above the rubber block. A piece of glass cloth is then cut to fit the container and pressed into the polyester resin. Coloring materials are available to produce any color desired. Curing time may be adjusted by varying the percentage of catalyst used.

In an effort to produce a limpet container entirely satisfactory, all deficiencies reported were evaluated and attempts were made to improve on or eliminate them. One of the major concerns was a positive means of attaching the limpet to irregularly shaped surfaces as are often encountered in field operations. In order to solve this attachment problem, the following two conditions were considered:

1) The containers must be flexible.
2) The magnets must be free to adjust themselves to irregularly shaped surfaces.

For economy and early delivery, the flexible container approach was chosen as the first attempt to fulfill this performance requirement.

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

A search was made for a material having elastomeric properties which could be handled in much the same manner as the polyester resins. Of the flexible materials evaluated, Thiokol resins (cold molding compound) manufactured by the Minnesota Mining and Manufacturing Company (EC755) and those of the Permaflex Mold Company offered the most promise.

Several prototypes were produced using Thiokol resins with a considerable decrease in production rate. This was due to a minimum cure time of four hours necessary for this material as opposed to a minimum of fifteen minutes for the polyester resin. This decrease in production rate was considered unimportant since additional inexpensive molds could be fabricated to offset the loss.

Prototypes produced from this material were submitted for evaluation. Evaluation reports showed that considerable improvement was made on dampening sound transmission and only slight improvement on irregularly shaped surfaces. This report also pointed out that the performance on irregularly shaped surfaces depends on the contents of the payload compartment, e.g., if the item being carried should be rigid and the approximate size of the compartment, this would, to some extent, restrict the flexibility of the container. Further, it was found that these containers were too flexible and offered no protection to the contents.

In view of the above disadvantages, it was agreed to develop a magnet assembly capable of readjusting itself to irregularly shaped metal surfaces. This led to the investigation of new materials and molding techniques. A temporary aluminum mold was fabricated (Figure 3) in such a manner as to permit the magnet to extend outward from the container about 3/8 inch,

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

connected only by a 1/4 inch flexible plastic lead. This could be done during the molding operation. A 68 durometer polyvinyl chloride resin (Plastisol) was used. The molding techniques were much the same as for the Thiokol materials with the exception that a 400°F temperature was needed to change the liquid plastic to an elastomeric material.

Several prototypes constructed from this mold (Figure 3) were subjected to various vibration tests prior to a thorough evaluation. It was noted that the outward extension of the magnets made them easy to detect because of their unusual design. However, it was pointed out as a result of their excellent performance on irregularly shaped surfaces, that the mold should not be cannibalized since this type of magnet mounting could be tossed twenty feet or more and attach itself to a vertical surface.

Another aluminum mold was fabricated which provided a cavity within the boundaries of the container to accommodate a flexible magnet assembly (Figure 4). The first approach in the evaluation of a flexible mounting assembly was to solder one end of a short section of 1/4"diameter tension spring to a magnet and the other end to a mounting bracket. This approach proved unsuccessful due to the annealing effect on the spring during the soldering operation. Unsuccessful attempts were made to cast a plastic coating around the magnet and one end of the spring. It was then decided to utilize the elastomeric properties of the plastisol in lieu of the spring. A one cavity experimental mold was fabricated in order to cast a plastic case around the magnet leaving a 1/4 inch diameter lead as a means of attachment to the container. Temporary attachments were made to the container in an effort to select the correct durometer material to be used

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

in the magnet assembly. The varying of the durometer would have the same effect as varying the K factor of a spring. Vibration tests were conducted using varying payloads and it was found that a 70 durometer plastisol was optimum.

Due to the success achieved in the vibration tests, an eight cavity mold was fabricated to cast the magnet assembly. Considerable time was spent on the design of a magnet assembly and means of attachment which would be adaptable to containers of all sizes. An improved closure was developed and included in the aluminum mold (Figure 5). Casting techniques were improved resulting in the design of a completely closed mold. The success of the mold depends upon the use of a proper heat and cure cycle.

Previous commitments established a need for three different size containers; therefore, three permanent molds were fabricated utilizing the flexible plastic magnet assembly. A test agenda was written and tests performed accordingly. The results of these tests have been recorded and submitted.

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

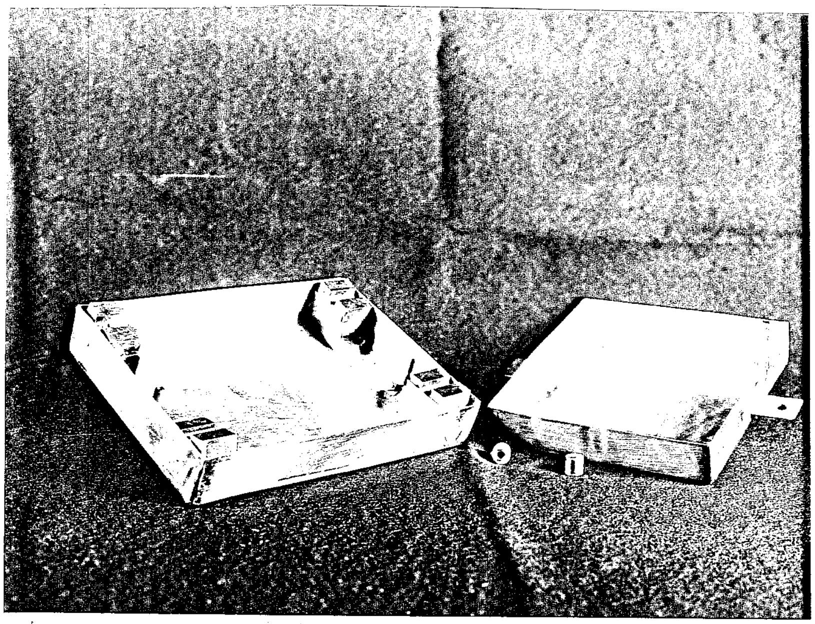

Figure 1A

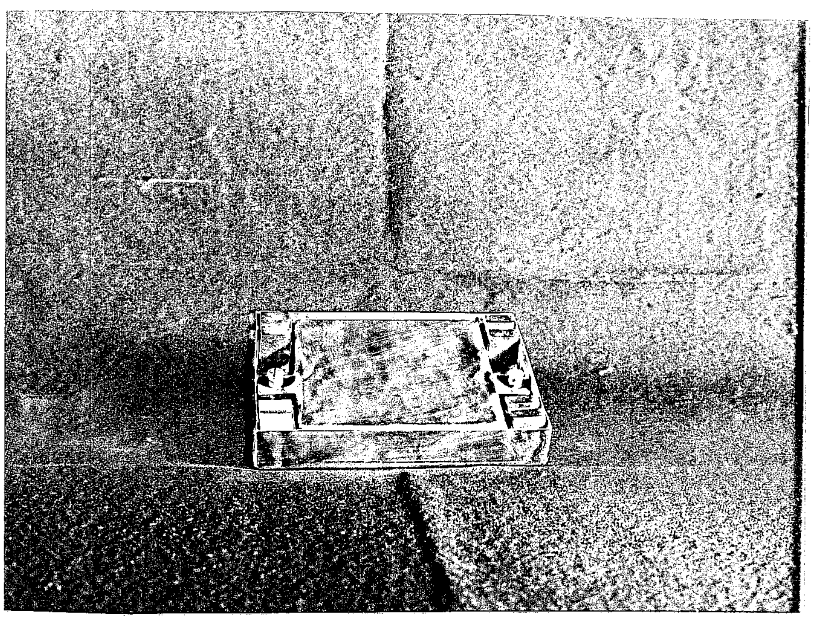

Figure 1B

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

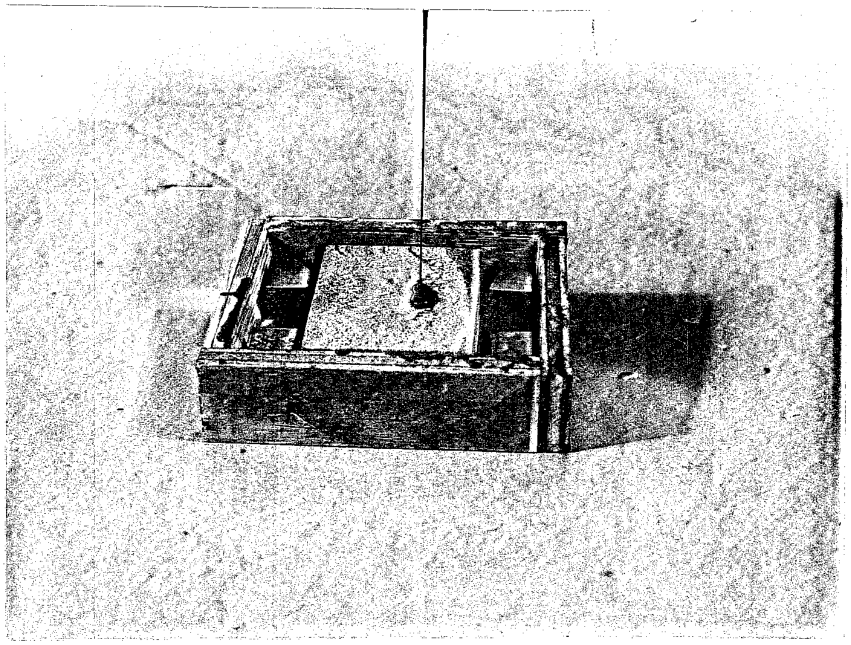

Figure 2

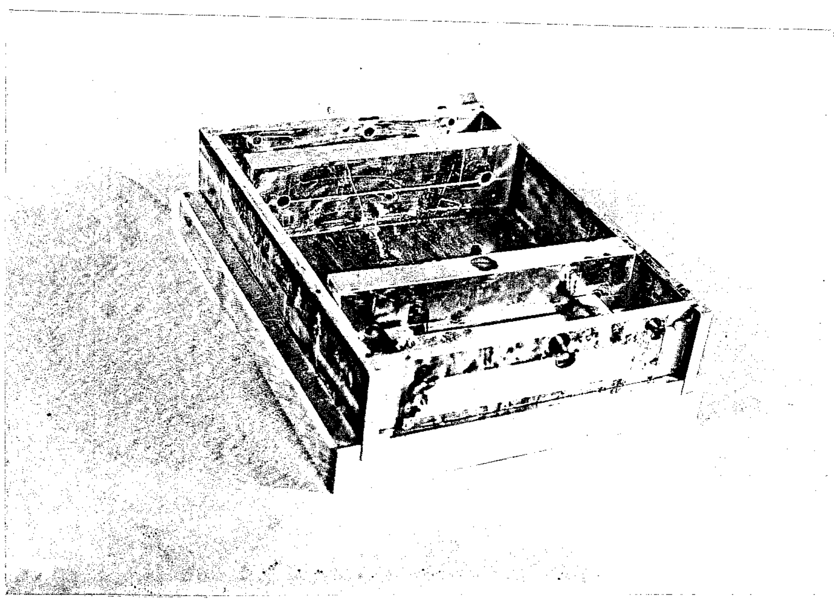

Figure 3

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

~~SECRET~~ CONFIDENTIAL

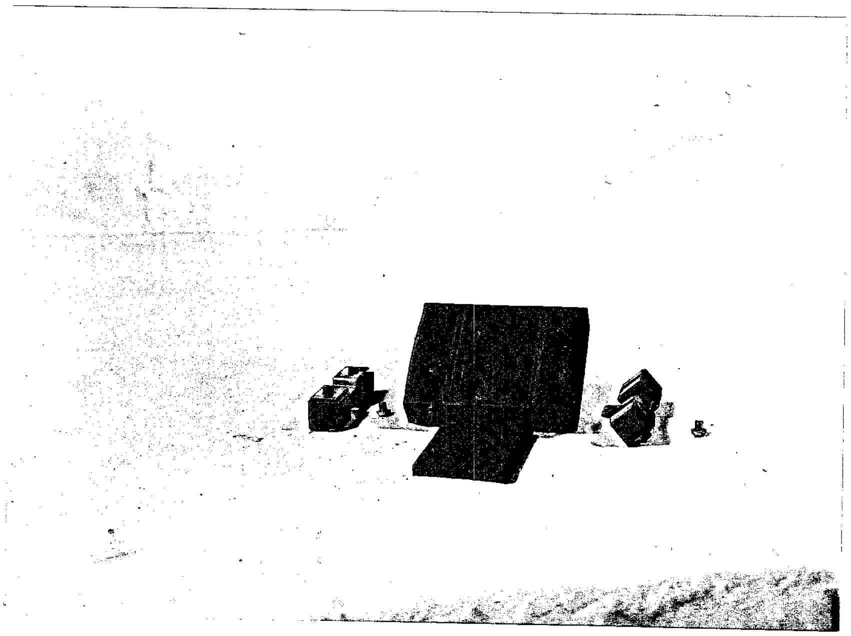

Figure 4

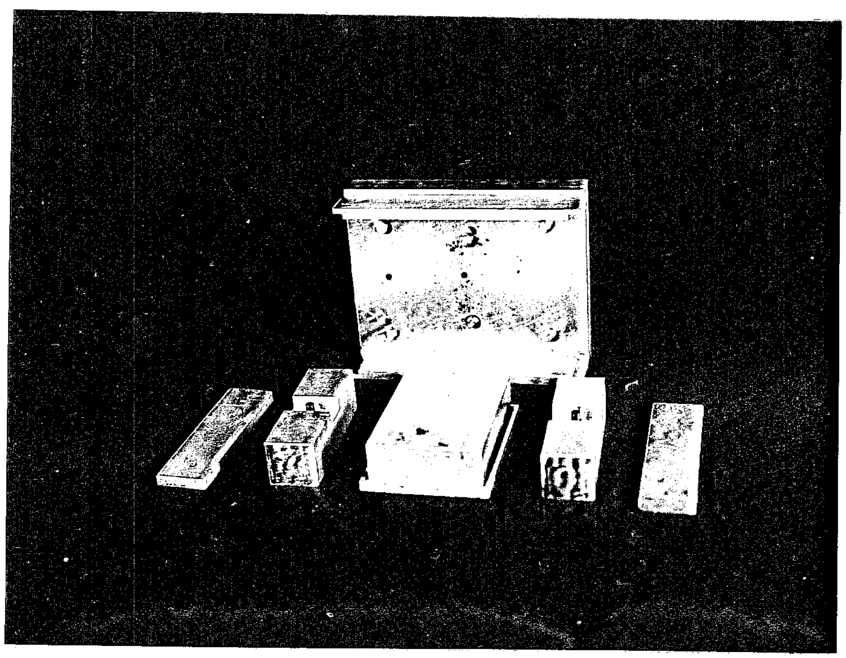

Figure 5

~~SECRET~~ CONFIDENTIAL

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9

Sanitized Copy Approved for Release 2011/09/20 : CIA-RDP78-03639A001500090001-9